

The four stroke cycle



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Learning objective



- To understand the mechanical working processes in a four stroke diesel engine.
- This course is to be used as a support to newly employed office staff with little or no knowledge of diesel engines

The master..... CV

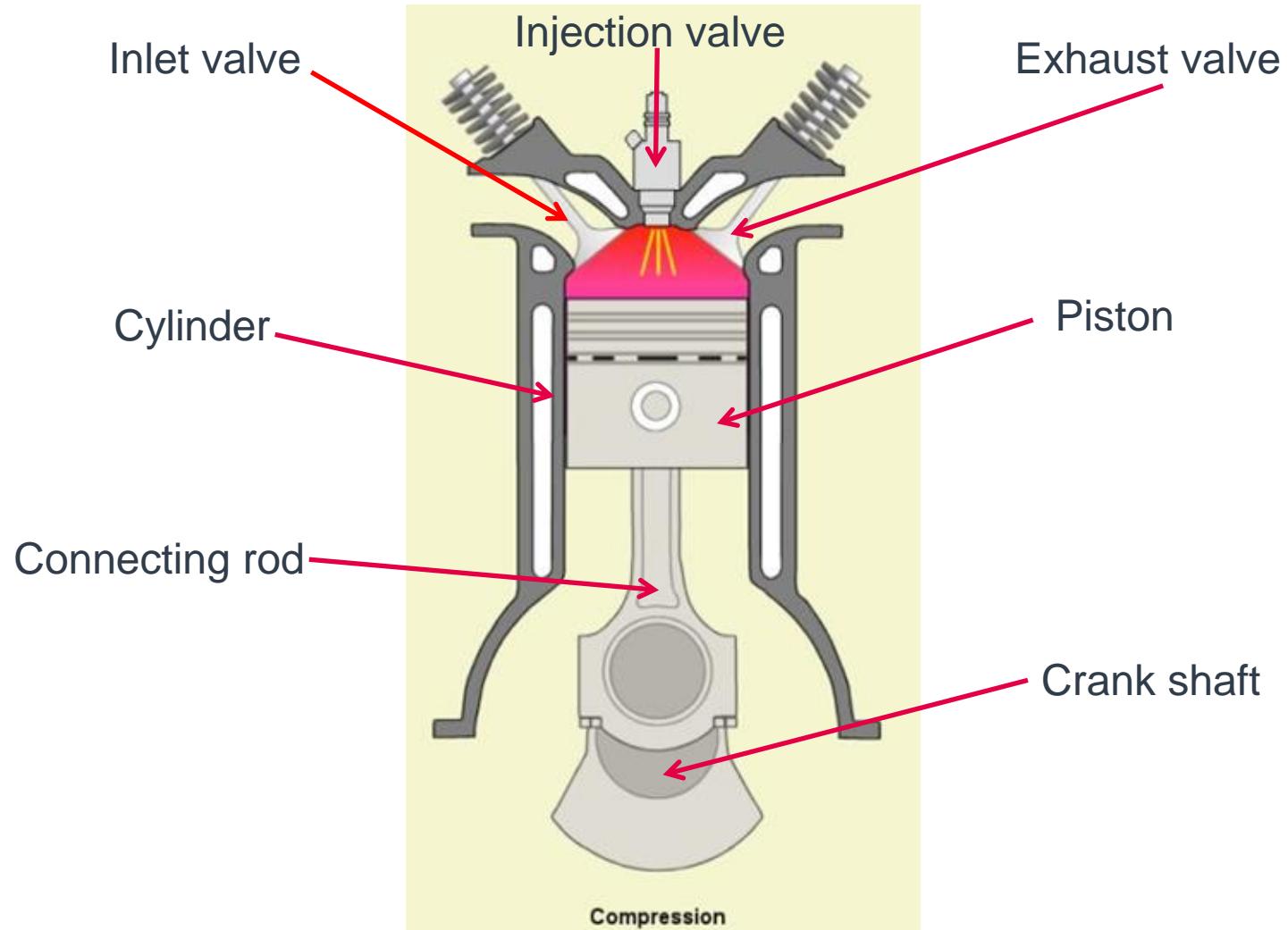


Full name: Rudolph Christian Karl Diesel
Born in Paris of Bavarian parents in 1858.
Mechanical engineer at the Technical University in Munich.
Became fascinated of thermodynamics and the maximum efficiency of the process.
Attempted to improve the existing thermal engines on the basis of purely theoretical considerations.

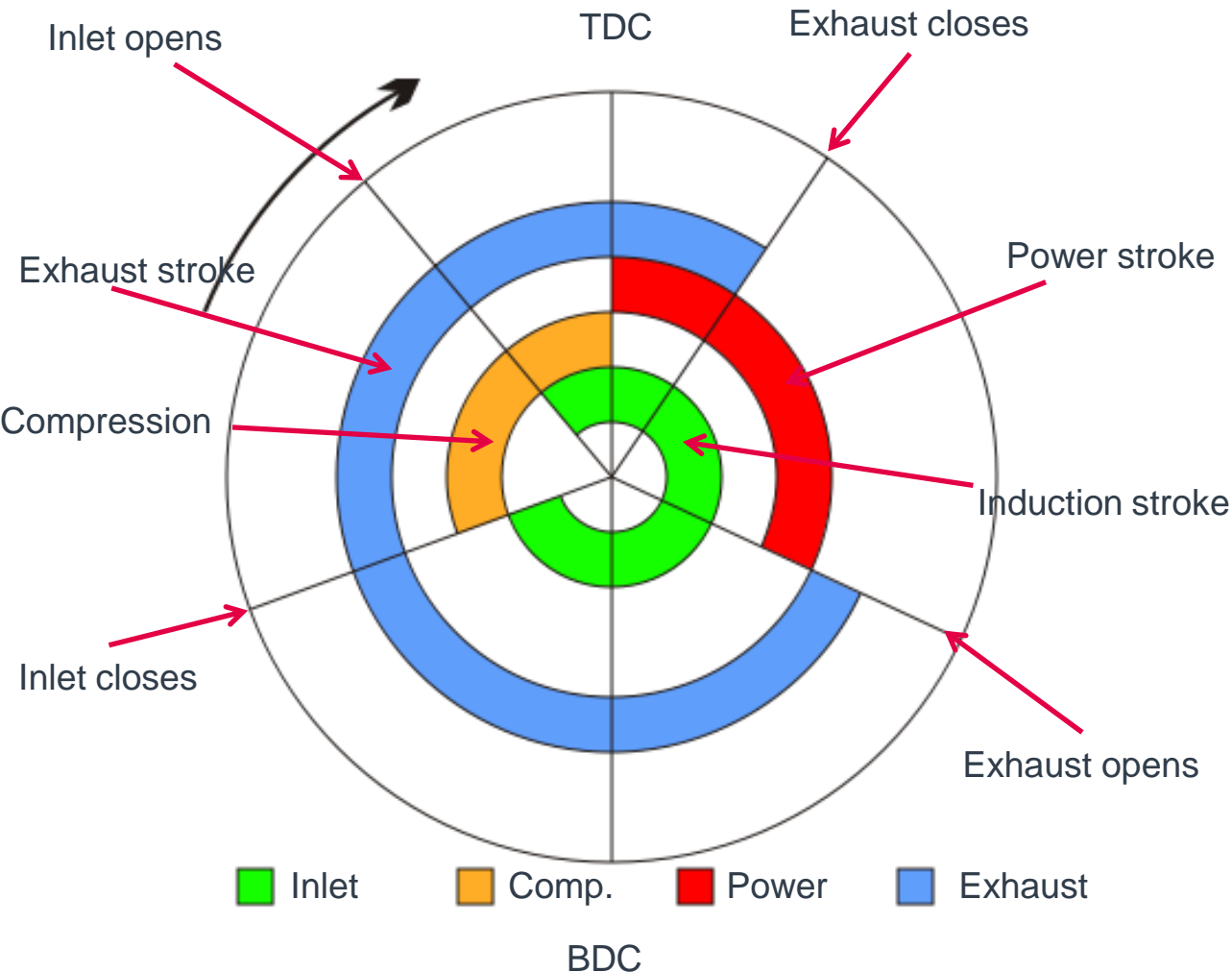
First prototype engine was built in 1893, a year after he applied for his initial patent, but it wasn't until the third prototype was built in 1897 that theory was put into practice with the first Four Stroke 'Diesel' engine.

These four strokes are often named as the induction, compression, power and exhaust strokes.

Expressions being used..



When valves opens and closes



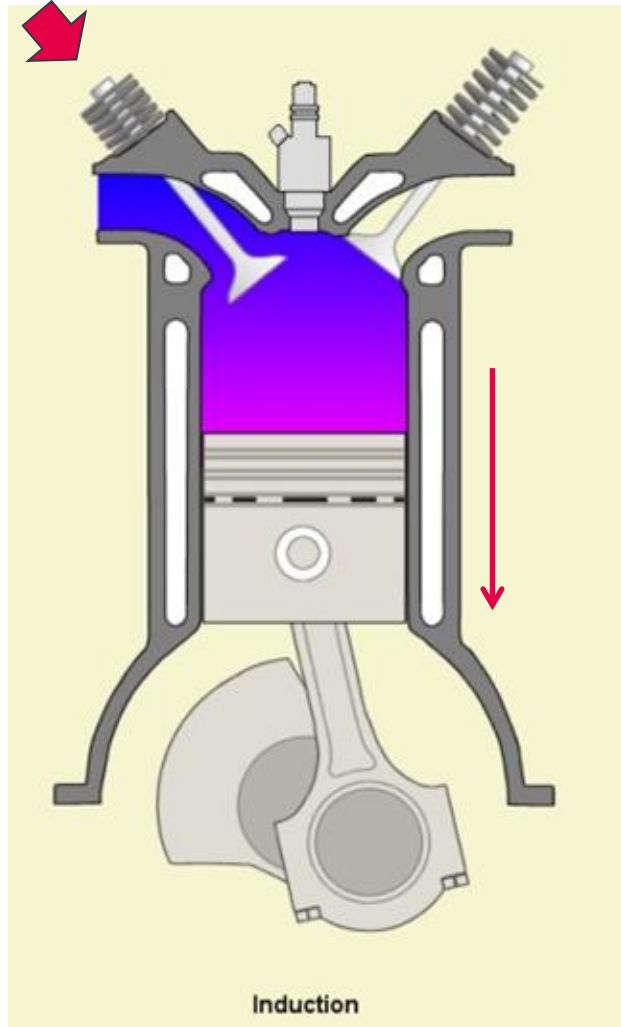
Theoretical, each strokes in the cycle complete at: Top Dead Centre (TDC) or Bottom Dead Centre (BDC).

However, in order to overcome:

1. Mechanical delays
2. The inertia of the new charge air
3. The velocity of the exhaust gases

Therefore - each of the strokes must begin and end outside the 0, 180, 360, 540 and 720 (0) degree crank positions

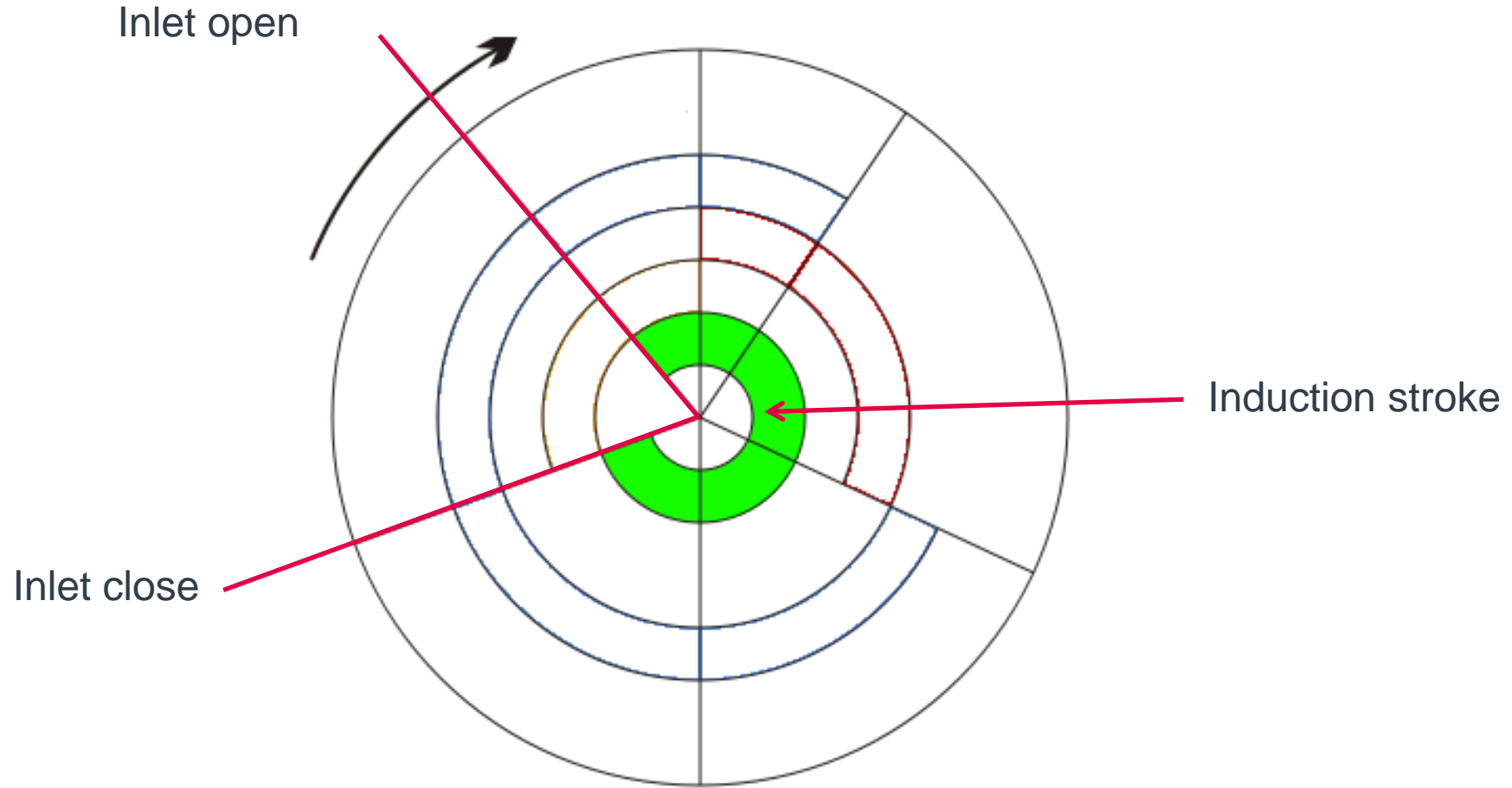
First stroke..... The induction



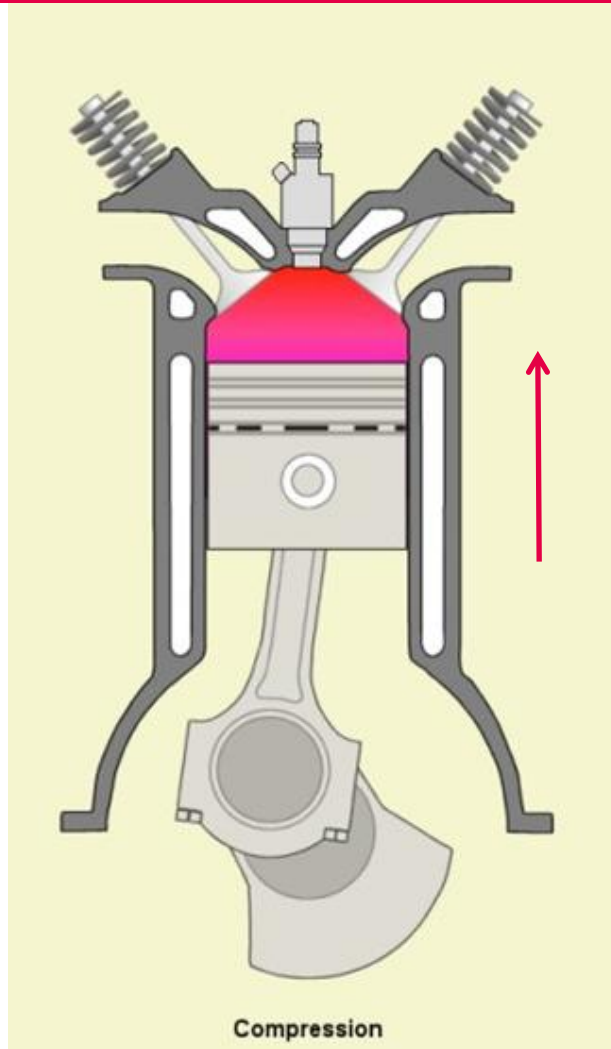
Induction Stroke

The induction (Inlet) stroke in a Diesel engine is used to draw in a new volume of charge air into the cylinder.

Valve diagram – Induction or Inlet



Second stroke....the compression



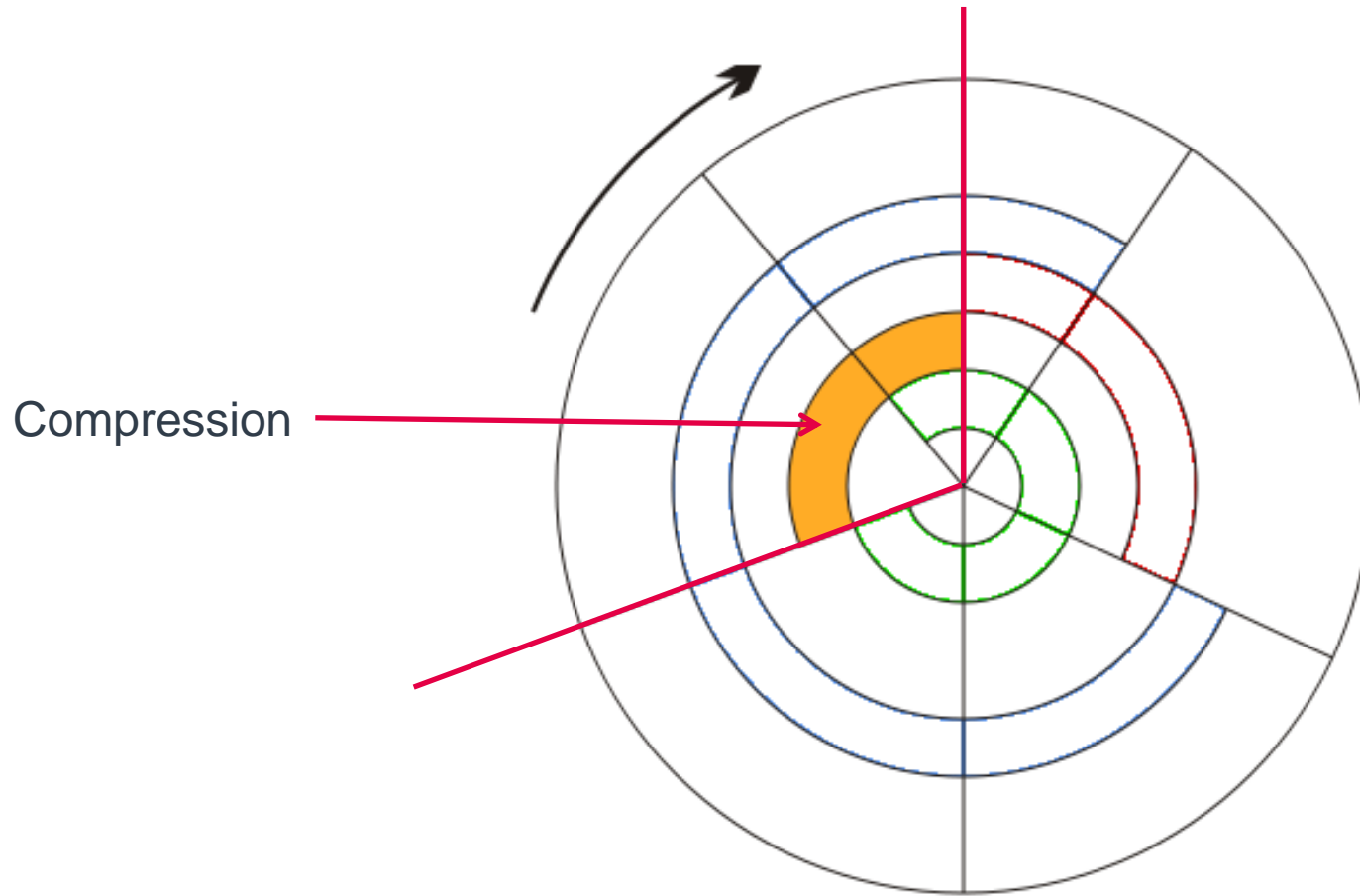
Compression Stroke

The compression stroke begins as the inlet valve closes and the piston is driven upwards in the cylinder bore by the momentum of the crankshaft and flywheel.

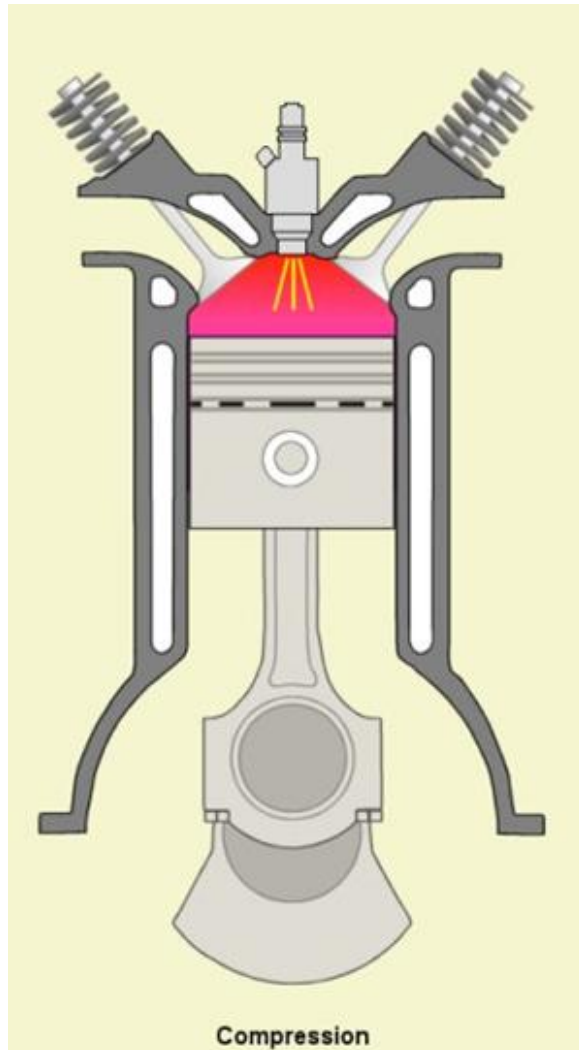
Temperature 500-750 °C

Pressure will be 55-200 bar

The compression stroke



The ignition takes place.....

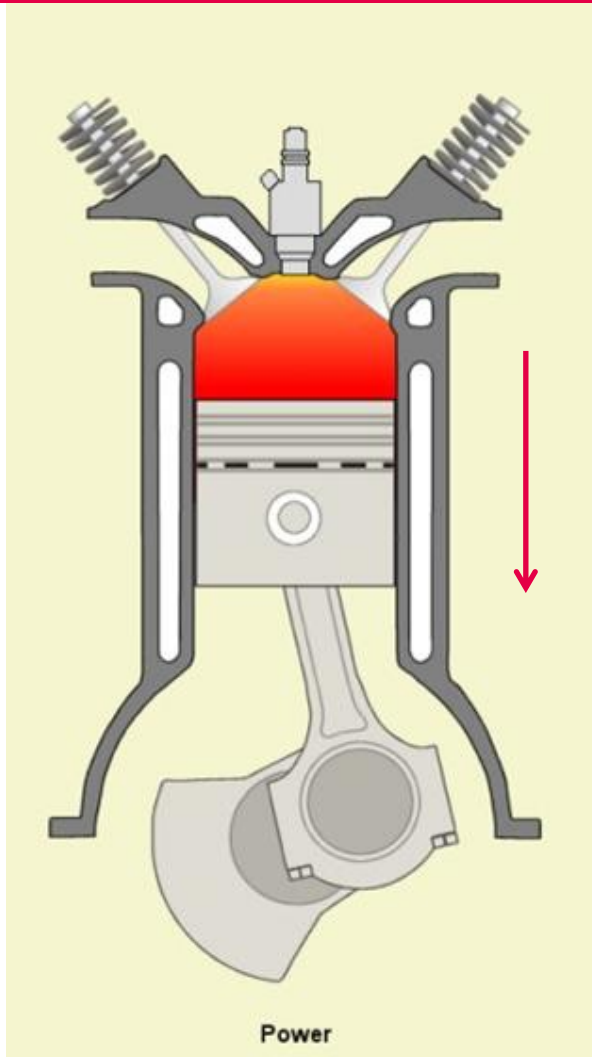


Compression Ignition

Compression ignition takes place when the fuel from the high pressure fuel injector ignites in the cylinder.

Combustion temp. will reach 1600°C

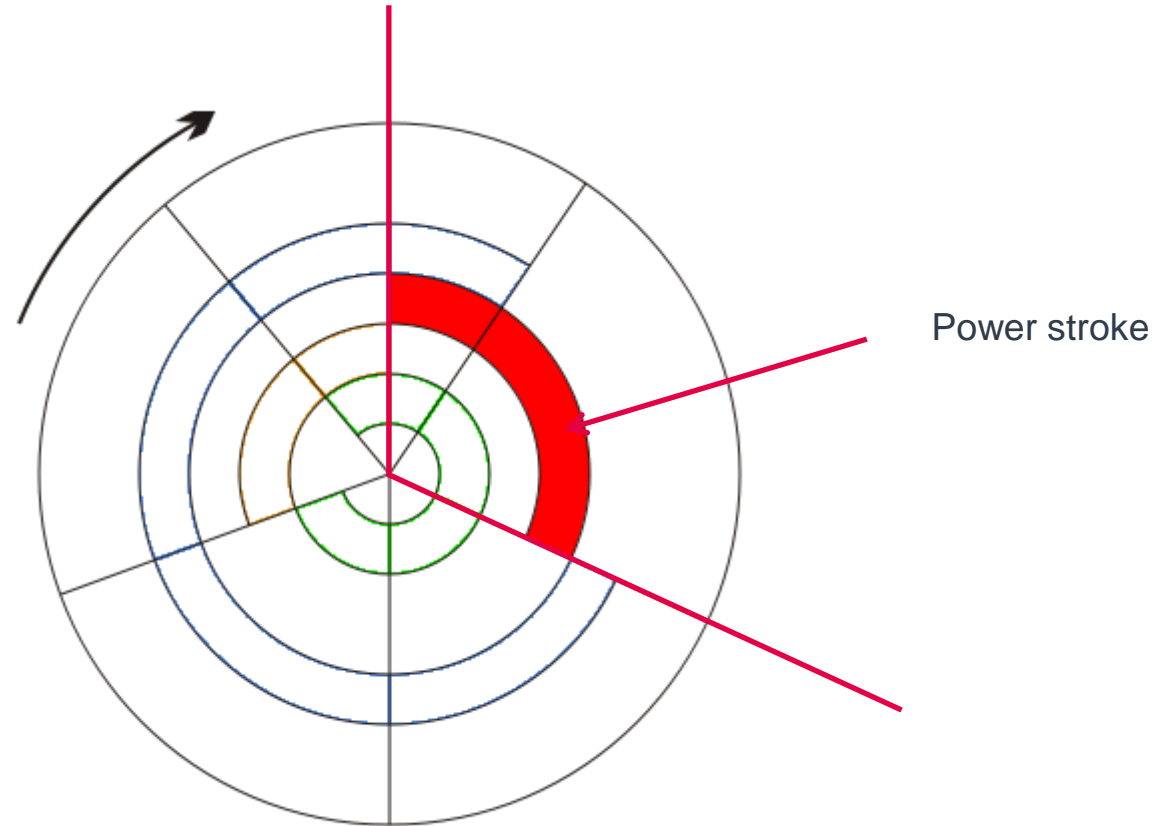
Third stroke..... The power stroke



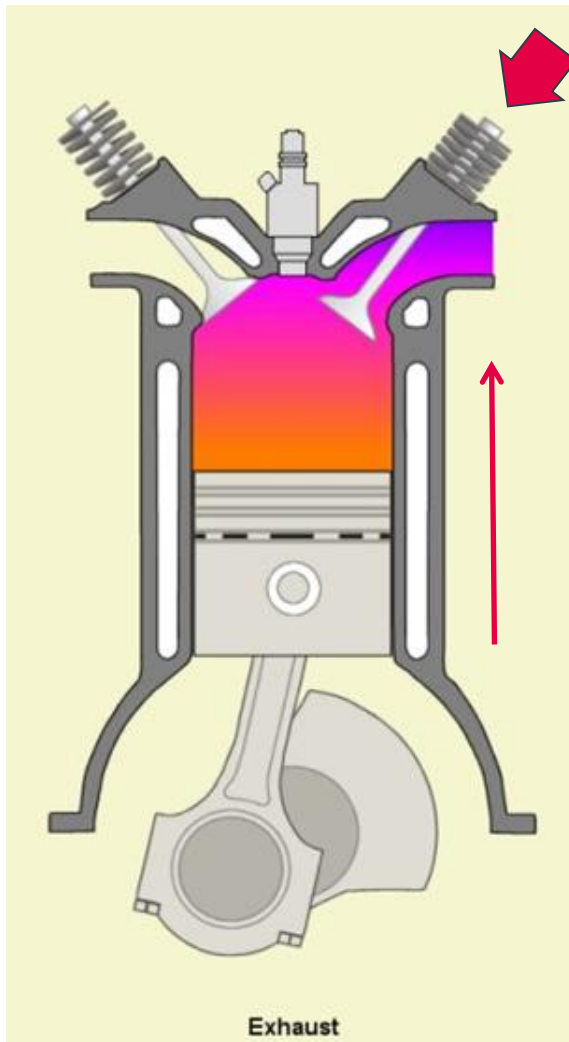
Power Stroke

The power stroke begins when the injected fuel ignites with the air in the cylinder.

The power stroke – no valve is open



Fourth stroke.....exhaust stroke

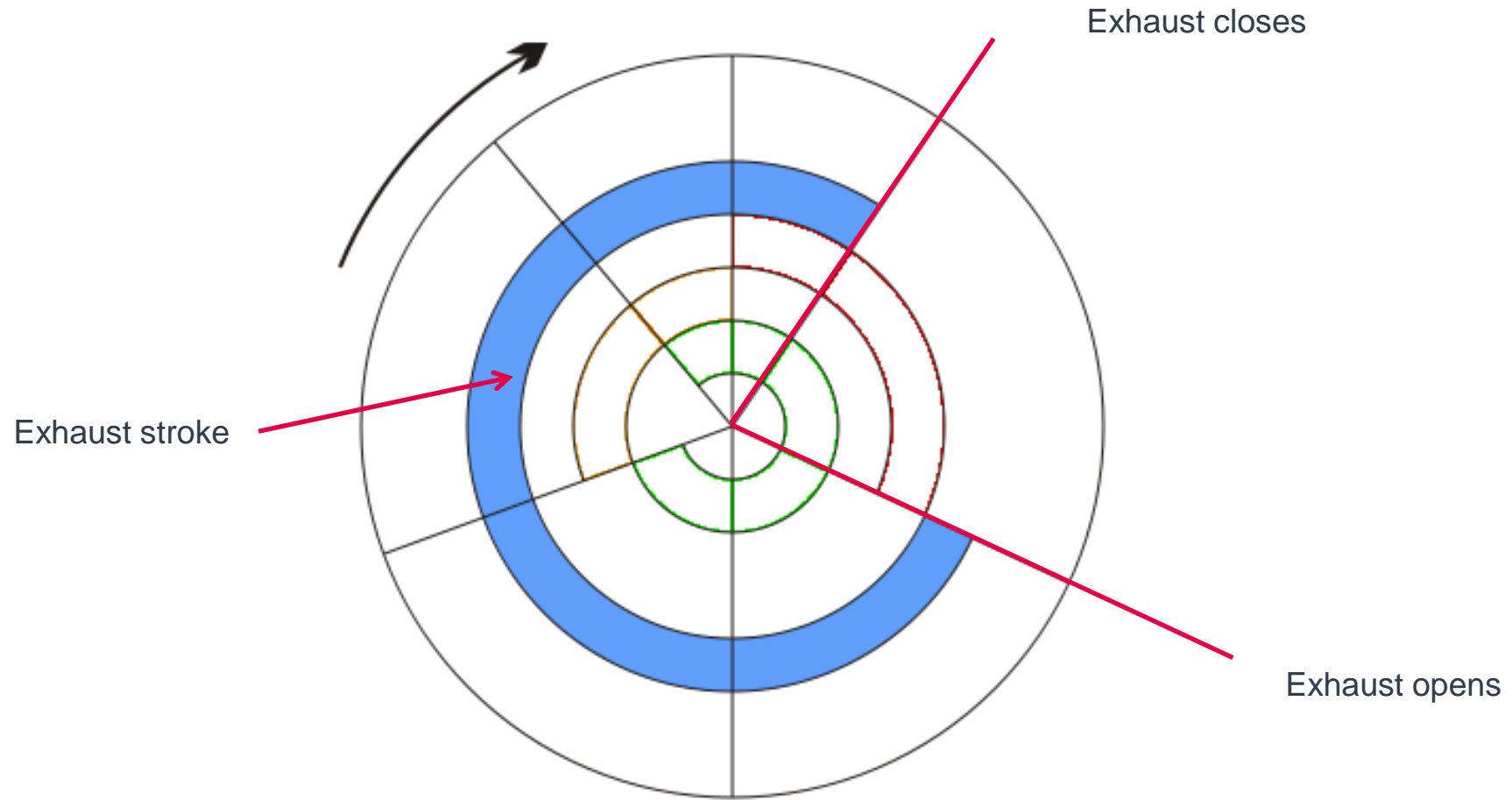


Exhaust Stroke

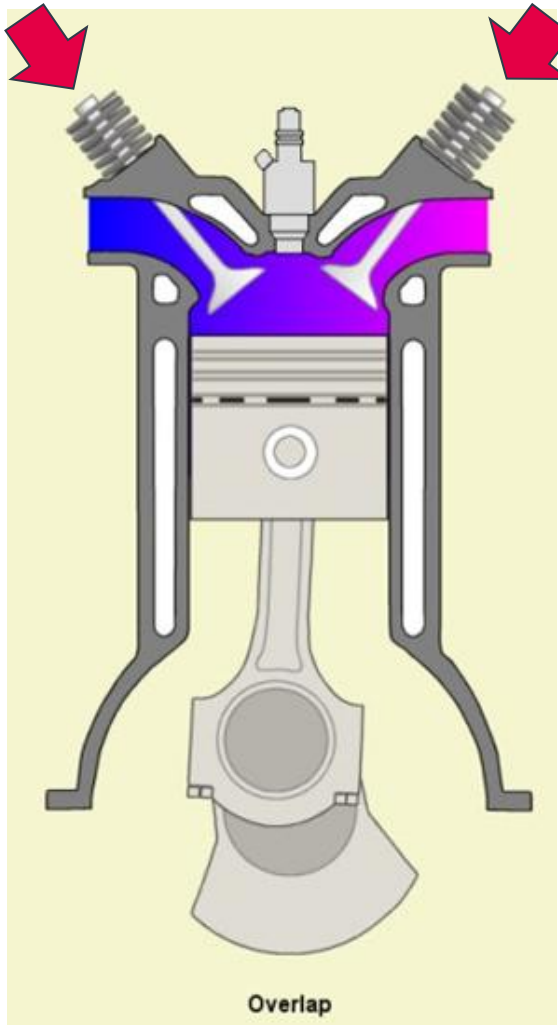
The exhaust stroke is as critical to the smooth and efficient operation of the engine as that of induction.

Temperature is dropped to 400-450°C

The exhaust stroke



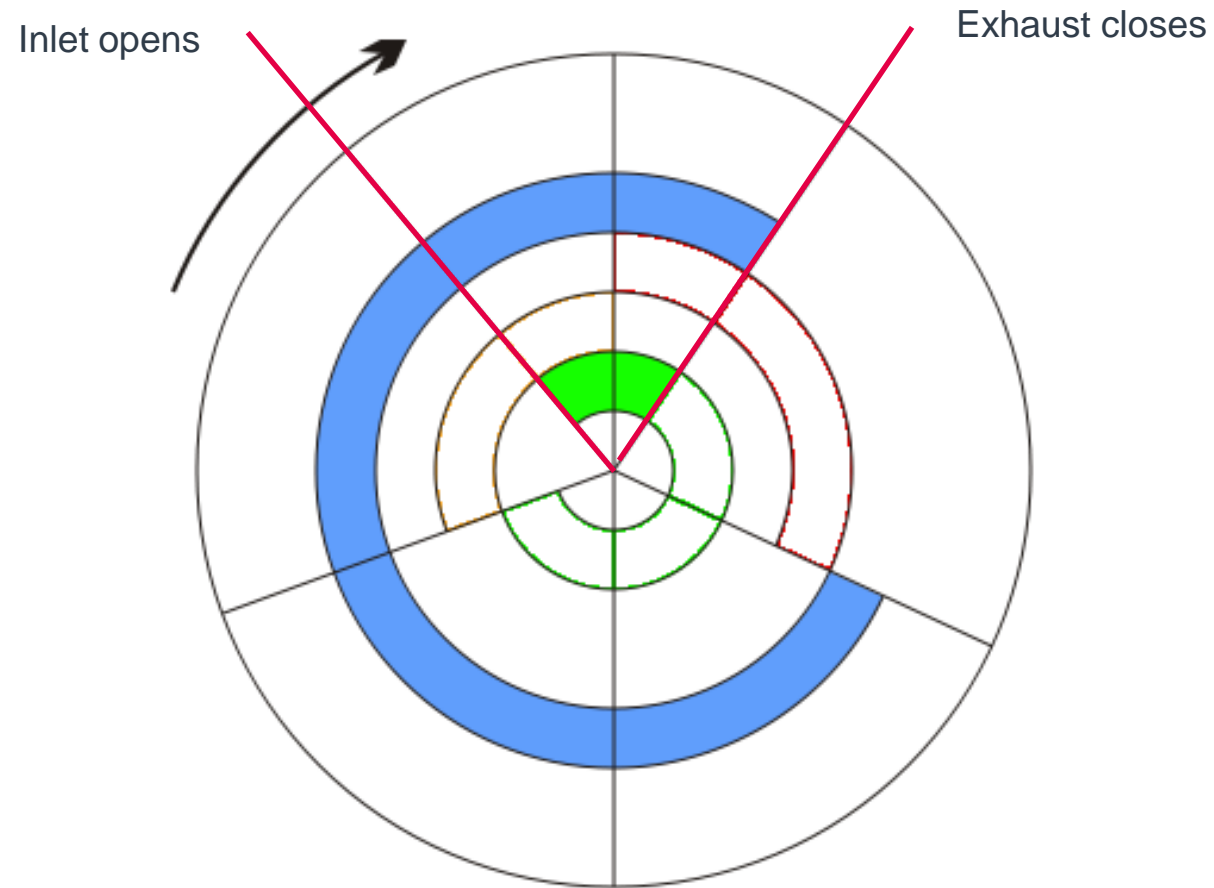
Four and a half stroke.....



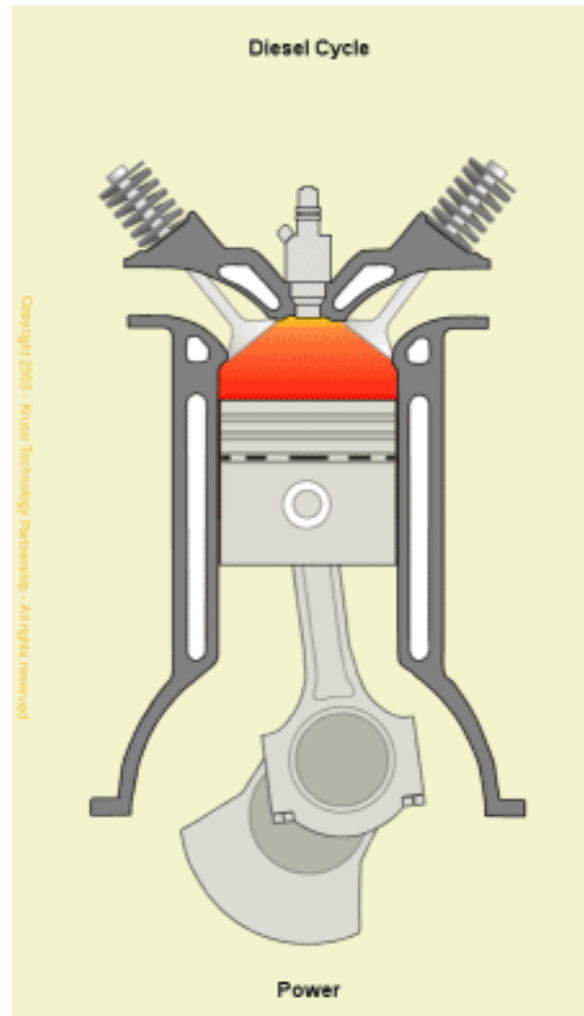
Exhaust and Inlet Valve Overlap

Exhaust and inlet valve overlap is the transition between the exhaust and inlet strokes and is necessary for the efficient running of any combustion engine

Overlapping stroke.....



The working cycle....



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Do you have any more questions?



